

We claim:

1. An isolated nucleic acid molecule encoding a proline-rich, extensin-like receptor kinase (PERK) polypeptide, or a fragment of a PERK polypeptide having PERK activity.
2. The molecule of claim 1, wherein the polypeptide is a signaling molecule associated with the cell wall via its extensin-like extracellular domain and is involved in the transduction of extracellular stimuli into an intracellular response through a cytoplasmic kinase domain, thereby bridging the cell wall-plasma membrane continuum.
3. The molecule of claim 1, wherein the extracellular stimuli includes wounding or pathogen attack.
4. The molecule of claim 1, wherein the wounding is selected from the group consisting of a cut, a break, a tear, a fold and an insect wound.
5. The molecule of claim 3, wherein the pathogen comprises bacterial pathogens, fungal pathogens, *Sclerotinia sclerotiorum*, *Cylindrosporium concertricum*, *Phoma lingam*, *Pseudomonas syringae*, *Streptomyces scabies*, Blackleg, Whiterust, *Fusarium* Head Blight, Rust, Bunt, Leaf Spot, White mold, root rot, *Fusarium* ear rot
6. An isolated nucleic acid molecule encoding a PERK polypeptide, a fragment of a PERK polypeptide having PERK activity, or a polypeptide having PERK activity, comprising a nucleic acid molecule selected from the group consisting of:
 - (b) a nucleic acid molecule that hybridizes to a nucleic acid molecule consisting of [SEQ ID NO:1], or a complement thereof under low, moderate or high stringency hybridization conditions wherein the nucleic acid molecule encodes a PERK polypeptide or a polypeptide having PERK activity;
 - (b) a nucleic acid molecule degenerate with respect to (a), wherein the nucleic acid molecule encodes a PERK polypeptide or a polypeptide having PERK activity.
7. The nucleic acid molecule of claim 2, wherein the hybridization conditions comprise low stringency conditions of 1XSSC, 0.1% SDS at 50°C or high stringency conditions of 0.1XSSC, 0.1% SDS at 65°C.

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8. An isolated nucleic acid molecule encoding a PERK polypeptide, a fragment of a PERK polypeptide having PERK activity, or a polypeptide having PERK activity, comprising a nucleic acid molecule selected from the group consisting of:

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- (a) the nucleic acid molecule of the coding strand shown in [SEQ ID NO:1], or a complement thereof;
 - (b) a nucleic acid molecule encoding the same amino acid sequence as a nucleotide sequence of (a); and
 - (c) a nucleic acid molecule having at least 17% identity with the nucleotide sequence of (a) and which encodes a PERK polypeptide or a polypeptide having PERK activity
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Sub B2 > 9. The nucleic acid molecule of any of claims 1 to 8, wherein the PERK polypeptide comprises a PERK1 polypeptide.

10. The nucleic acid molecule of claim 1, comprising all or part of a nucleotide sequence shown in [SEQ ID NO:1] or a complement thereof.

15 11. The nucleic acid molecule of claim 1, consisting of the nucleotide sequence shown in [SEQ ID NO:1] or a complement thereof.

12. A PERK1 nucleic acid molecule isolated from *Brassica*, or a fragment thereof.

13. The nucleic acid molecule of claim 12, wherein the *Brassica* comprises *Brassica napus*, *Brassica juncea*, *Brassica rapa* or *Brassica oleracea*.

20 Sub B3 > 14. A recombinant nucleic acid molecule comprising a nucleic acid molecule of any of claims 1 to 4 and a constitutive promoter sequence or an inducible promoter sequence, operatively linked so that the promoter enhances transcription of the nucleic acid molecule in a host cell.

25 15. The nucleic acid molecule of claim 1, wherein the molecule comprises genomic DNA, cDNA or RNA.

16. The nucleic acid molecule of claim 13, wherein the nucleic acid molecule is chemically synthesized.

17. An isolated nucleic acid molecule comprising a nucleic acid molecule selected from the group consisting of 8 to 10 nucleotides of the nucleic acid molecule of claim 6, 11 to 25

nucleotides of the nucleic acid molecule of claim 6 and 26 to 50 nucleotides of the nucleic acid molecule of claim 10.

18. The nucleic acid molecule of claim 1, comprising at least 30 consecutive nucleotides of [SEQ ID NO:1] or a complement thereof.

19. A vector comprising the nucleic acid molecule of any of claims 1 to 4.

20. The vector of claim 19, comprising a promoter selected from the group consisting of a super promoter, a 35S promoter of cauliflower mosaic virus, a chemical inducible promoter, a copper-inducible promoter, a steroid-inducible promoter and a tissue-specific promoter.

21. A host cell comprising the recombinant nucleic acid molecule of claim 1 or the vector of claim 19, or progeny of the host cell.

22. The host cell of claim 21, selected from the group consisting of a fungal cell, a yeast cell, a bacterial cell, a microorganism cell and a plant cell.

23. A plant, a plant part, a seed, a plant cell or progeny thereof comprising the recombinant nucleic acid molecule of claim 15 or the vector of claim 19.

24. The plant part of claim 23, comprising all or part of a leaf, a flower, a stem, a root or a tuber.

25. The plant, plant part, seed or plant cell of claim 23, wherein the plant, plant part, seed or plant cell is of a species selected from the group consisting of *Brassica napus*, *Brassica rapa*, *Brassica juncea*, *Brassica oleracea*, or from the family Brassicaceae, Arabidopsis, potato, tomato, tobacco, cotton, carrot, petunia, sunflower, strawberries, spinach, lettuce, rice, soybean, corn, wheat, rye, barley, sorghum and alfalfa.

26. The plant, plant part, seed or plant cell of claim 23, wherein the plant comprises a dicot plant.

27. The plant, plant part, seed or plant cell of claim 23, wherein the plant comprises a monocot plant.

28. An isolated polypeptide encoded by and/or produced from the nucleic acid molecule of any of claims 1 to 4, or the vector of claim 19.

29. An isolated PERK polypeptide or a fragment thereof having PERK activity.

30. An isolated polypeptide, the amino acid sequence of which comprises at least ten consecutive residues of [SEQ ID NO:2].

31. An isolated immunogenic polypeptide, the amino acid sequence of which comprises at least 8 consecutive residues of [SEQ ID NO:2].

5 32. An isolated polypeptide, the amino acid sequence of which comprises residues 1 to 137, 138 to 160 and 161 to 648 of [SEQ ID NO:2].

33. The polypeptide of claim 29 comprising all or part of an amino acid sequence in [SEQ ID NO:2].

10 34. A polypeptide fragment of the PERK polypeptide of claim 29, or a peptide mimetic of the PERK polypeptide.

35. The polypeptide fragment of claim 33, consisting of at least 20 amino acids, which fragment has PERK activity.

36. The fragment or peptide mimetic of claim 34, which is capable of being bound by an antibody to the polypeptide of claim 28.

15 37. The polypeptide of claim 28 which is recombinantly produced.

38. An isolated and purified polypeptide comprising the amino acid sequence of a PERK polypeptide, wherein the polypeptide is encoded by a nucleic acid molecule that hybridizes under moderate or stringent conditions to a nucleic acid molecule in [SEQ ID NO:1], a degenerate form thereof or a complement.

20 39. A polypeptide comprising a sequence having greater than 20% sequence identity to the polypeptide of claim 33.

40. The polypeptide of claim 28, wherein the polypeptide comprises a PERK polypeptide.

41. The polypeptide of claim 40, isolated from *Brassica*.

25 42. The polypeptide of claim 41, wherein the *Brassica* comprises *Brassica napus* or *Brassica juncea* or *Brassica rapa* or *Brassica oleracea*.

43. The polypeptide of claim 39, comprising a kinase domain including at least 30% homology to the kinase domain of [SEQ ID NO.:2] and/or an extracellular domain including at least 20% homology to the extracellular domain of [SEQ ID NO.:2].

44. An isolated nucleic acid molecule encoding the polypeptide of claims 29 or 33.

45. An antibody directed against the polypeptide of claim 33.
46. The antibody of claim 45, comprising a monoclonal antibody or a polyclonal antibody.
47. An isolated nucleic acid molecule encoding a polypeptide that reduces the severity of wounding or pathogen attack in a plant, the polypeptide comprising:

- 5 (a) an extracellular domain which recognizes an extracellular binding molecule whose level is increased during the wounding or pathogen attack, the extracellular domain encoding a plurality of repeats selected from the group consisting of SPPPP, SPP, PP and PPP, wherein a plurality of the proline molecules are capable being glycosylated and/or hydroxylated;
- 10 (b) a membrane domain operably connected to the extracellular domain, wherein the membrane domain is capable of extending across a cell membrane from the extracellular side of the membrane to intracellular side of the membrane; and
- (c) a cytoplasmic domain operably connected to the membrane domain, wherein the cytoplasmic domain comprises a means for producing kinase activity when the
- 15 extracellular binding molecule interacts with the extracellular domain.